

## DESCRIPTION

### MOVING IMAGE MANAGEMENT APPARATUS AND METHOD

#### 5 TECHNICAL FIELD

The present invention relates to moving image data management apparatus and method for management of moving image data recorded on a storage medium by one or plural representative images.

10

#### BACKGROUND ART

Conventionally, a method of managing moving images recorded on a storage medium by using representative images has been proposed. Japanese Patent No. 03081304  
15 discloses utilizing representative images in general reproduction apparatus for moving and still images, and especially discloses using representative images for simplified display upon selection of still or moving image. Further, Japanese Published Unexamined Patent  
20 Application Nos. Hei 11-176137 and 2000-322875 disclose assigning a representative image to a moving image section, and selecting a section as a target of reproduction designation by using the representative image.

25

As such representative image is generally used, variety of usage of representative image increases. For example, image management using the representative

images can be applied to an editing apparatus as well as the above-described reproduction apparatus.

However, even regarding the same moving image, a representative image appropriate to a user interface upon reproduction and a representative image appropriate to a user interface upon editing are different from each other. Accordingly, if the same representative image is to be used in various apparatuses including an editing apparatus, the following problem occurs.

For example, in Fig. 1, reference numeral 11 denotes a moving image. In this moving image, the motion of a batter who holds a bat at the ready and hits a ball is recorded in a section (a). Numerals 12 and 13 denote representative images regarding the same section (a). The representative image 12, formed from a head frame of the section (a), is an image of the batter at the ready. The representative image 13, which is an image of the batter when he hits the ball, is a most appropriate representative image to indicate the content of the section (a).

Generally, as one representative image is assigned to one section, one of the representative images 12 and 13 is actually registered as a representative image of the section (a). The registered representative image can be used as an index image for e.g. a reproduction apparatus. However, if the representative image 13 is registered, upon selection of representative image in

the reproduction apparatus, reproduction starts from a status prior to the hit, thus a user feels unnatural. On the other hand, if the representative image 12 is registered, when the image is used in an editing apparatus, the content of the section (a) cannot be precisely grasped by the image 12. That is, in the example of Fig. 1, it cannot be determined from the representative image 12 whether the section (a) indicates a scene where the batter hits the ball or a scene where the batter swings at the ball and miss. In this manner, an appropriate representative image in one section of moving image depends on the purpose of apparatus to be used.

Conventionally, assignment and management of representative images are necessary in accordance with purpose and usage of moving image data such as reproduction and editing. Accordingly, information on the representative images are redundantly held by moving image or still image, or by apparatus or usage. Further, program code for processing to utilize the information is respectively held for the representative images. That is, when the representative images are utilized in various moving image data processing, the information on the representative images are respectively managed by apparatus or program. Accordingly, it is wasteful to independently store the representative image data. To attain excellent operability upon use of appropriate

representative image, management of representative images becomes complicated.

#### DISCLOSURE OF THE INVENTION

5           The present invention has been made in consideration of the above problem, and has its object to improve operability of moving image data using representative images upon execution of various moving image data processing and to simplify management of the  
10 representative images.

          According to the present invention, the foregoing object is attained by providing a moving image management apparatus for management of plural moving images recorded on a storage medium in correspondence  
15 with one or plural representative images, comprising: means for recording a representative image representing an arbitrary section or the whole of a moving image; means for recording information indicating the section or the whole of the moving image represented by said  
20 representative image in correspondence with said representative image; and means for recording information indicating a position of an image as a base of said representative image in correspondence with said representative image, wherein in case of said  
25 representative image is designated by a user, it is interpreted that the section or the whole of the moving image represented by the representative image is

selected.

According to another aspect of the present invention, the foregoing object is attained by providing a moving image management apparatus for management of plural moving images recorded on a storage medium in correspondence with one or plural representative images, comprising: generation means for generating a representative image representing an arbitrary section or the whole of a moving image; first recording means for recording information indicating the section or the whole of the moving image represented by said representative image in correspondence with said representative image; and second recording means for recording information indicating a position of an image as a base of said representative image in correspondence with said representative image.

Still another aspect of the present invention, the foregoing object is attained by providing a moving image management method for management of plural moving images recorded on a storage medium in correspondence with one or plural representative images, comprising: a step of recording a representative image representing an arbitrary section or the whole of a moving image; a step of recording information indicating the section or the whole of the moving image represented by said representative image in correspondence with said representative image; and a step of recording

information indicating a position of an image as a base  
of said representative image in correspondence with said  
representative image, wherein in case of said  
representative image is designated by a user, it is  
5 interpreted that the section or the whole of the moving  
image represented by the representative image is  
selected.

Still another aspect of the present invention, the  
foregoing object is attained by providing a moving image  
10 management method for management of plural moving images  
recorded on a storage medium in correspondence with one  
or plural representative images, comprising: a  
generation step of generating a representative image  
representing an arbitrary section or the whole of a  
15 moving image; a first recording step of recording  
information indicating the section or the whole of the  
moving image represented by said representative image in  
correspondence with said representative image; and a  
second recording step of recording information  
20 indicating a position of an image as a base of said  
representative image in correspondence with said  
representative image.

Other features and advantages of the present  
invention will be apparent from the following  
25 description taken in conjunction with the accompanying  
drawings, in which like reference characters designate  
the same name or similar parts throughout the figures

thereof.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated  
5 in and constitute a part of the specification,  
illustrate embodiments of the invention and, together  
with the description, serve to explain the principles of  
the invention.

Fig. 1 is an explanatory view of problem in  
10 utilization of representative image;

Fig. 2 is a block diagram showing a control  
construction of a moving image processing apparatus  
according to an embodiment;

Fig. 3 is a block diagram showing a functional  
15 construction of the moving image processing apparatus  
according to the embodiment;

Fig. 4 is a schematic diagram showing an example  
of thumbnail storage status in a moving image file  
according to the embodiment;

20 Fig. 5 is a table showing an example of data  
structure for 1 index in an index area 406 in a footer  
403 in Fig. 4;

Figs. 6A and 6B are tables showing examples of  
data structure of thumbnail 405 in a header 401 and 1  
25 thumbnail in a thumbnail area 407 in the footer 403 in  
Fig. 4;

Fig. 7 is a flowchart showing an example of

thumbnail registration operation according to the embodiment;

Figs. 8A and 8B are examples of user interface upon execution of browser;

5 Figs. 9A and 9B are flowcharts showing processing upon browser operation in the moving image management apparatus;

Fig. 10 is an example of the user interface upon moving image editing by an editing unit 305;

10 Fig. 11 is a flowchart showing a thumbnail display operation upon the moving image editing by the editing unit 305; and

Fig. 12 is a flowchart explaining utilization of thumbnail in print operation.

15

#### BEST MODE FOR CARRYING OUT THE INVENTION

A preferred embodiment of the present invention will now be described in detail in accordance with the accompanying drawings.

20 In the present embodiment, in a method for utilizing representative images, to manage/utilize information related to representative images in a simple manner, the information is prepared for shared access, and redundant information for distinction or shared  
25 access is added to the information related to representative images in correspondence with usage or the like. In this arrangement, information on the



representative images or the like can be recorded and stored in a simple manner, thus waste is avoided.

Further, according to the present embodiment, as information necessary for realizing unique functions of  
5    respective apparatuses and programs is included in the information on representative images or the like, the functions can be realized. Further, upon storage of the information related to representative image, the arrangement, format or the like of the storage is  
10    changed in accordance with usage or format of the information.

Fig. 2 is a block diagram showing a control construction of a moving image processing apparatus according to the present embodiment. In Fig. 2, numeral  
15    201 denotes a CPU which performs various controls in the moving image management apparatus. Numeral 202 denotes a ROM in which a boot program executed upon boot-up of the apparatus and various data are stored. Numeral 203 denotes a RAM in which a control program for processing  
20    by the CPU 201 is stored, and which provides a work area for execution of various controls by the CPU 201. Numeral 204 denotes a keyboard, and 205, a mouse, providing an environment for user's various input operations.

25    Numeral 206 denotes an external storage device comprising a hard disk, a floppy disk, an optical disk, a magneto-optic disk, a magnetic tape, non-volatile type

semiconductor memory (e.g. flash memory) or the like.  
Numeral 207 denotes a display unit comprising a display  
or the like which displays a user interface upon image  
editing, the result of image editing and the like for  
5 the user. Numeral 208 denotes a network interface which  
enables communication with respective devices on a  
network. Numeral 209 denotes a video interface which  
reads a moving image from a video camera 210 and a VTR  
212. Numeral 211 denotes a bus interconnecting the above  
10 respective elements.

Note that the video camera 210, the VTR 212 and  
the external storage device 206 are not limited to those  
incorporated in or directly connected to the apparatus,  
but devices arranged on the network can be used.

15 Fig. 3 is a block diagram showing a functional  
construction of the moving image processing apparatus  
according to the present embodiment. Numeral 300 denotes  
a user operation unit which obtains the user's  
designation or input via the keyboard 204, the mouse 205  
20 and the like. Numeral 301 denotes a moving image input  
unit which reads a moving image from the video camera  
210, the VTR 212 or the like via the video I/F 209, and  
inputs the image into the apparatus. Numeral 302 denotes  
a moving image file storage unit comprising the external  
25 storage device 206, which holds moving images inputted  
by the moving image input unit 301 in file format.

Numeral 303 denotes a thumbnail formation unit

which presents a moving image stored in the moving image file storage unit 302 on the display unit 207, such that the user designates a desired section and a frame image in the section. The thumbnail formation unit forms a  
5 reduced image (hereinbelow, thumbnail image) based on the designated frame image, and stores it, with information on the designated section or the like, into the moving image file storage unit 302. That is, by the thumbnail formation unit 303, the user can refer to the  
10 moving image presented on the display unit 207, and designate a section in the moving image and a frame representing the section via the user operation unit 300. Then the thumbnail image based on the designated frame image is stored, with the information on the designated  
15 section or the like, into the moving image file storage unit 302.

Numerical 304 denotes a browser unit which reads a thumbnail from the moving image file storage unit 302 and displays it via the display unit 207, and reproduces  
20 a moving image corresponding to the thumbnail selected by the user. Numerical 305 denotes an editing unit which performs editing on a moving image in the moving image file storage unit 302. Further, the progress and result of the editing are displayed via the display unit 207.

25 Note that the functions of the above-described respective elements are realized by execution of the control program stored in the ROM 202 by the CPU 201.

Otherwise, it may be arranged such that the control program is appropriately loaded from the external storage device 206 onto the RAM 203 and executed by the CPU 201.

5 <1. Thumbnail Storage Method>

Fig. 4 is a schematic diagram showing an example of thumbnail storage status in a moving image file according to the embodiment.

Numerals 400 denotes a moving image file stored on  
10 a storage medium by a moving image file storage unit 302. Note that the unit of storage is not limited to 1 moving image file, but the unit may be a shot from depression of recording button of the image sensing device to  
15 stoppage of image sensing, or may be 1 TV broadcast program. The moving image file 400 comprises a header 401 in which management information or the like is recorded, a moving image 402 in which moving image data itself is recorded, and a footer 403 in which mainly a thumbnail is recorded.

20 In the header 401, moving image file management information 404 on the data size, the format, the date of formation and the like of the moving image file, and 1 image of thumbnail 405 are recorded. The footer 403 has a thumbnail area 407 in which plural thumbnails can  
25 be recorded and an index area 406 in which index information on the respective thumbnails are recorded.

Fig. 5 is a table showing an example of data

structure for 1 index in the index area 406 in the footer 403 in Fig. 4. In the figure, "Start Point" and "End Point" are start point and end point of a section in a moving image represented by the thumbnail. The form of the start point and the end point is not particularly limited as long as the points specify the section in the moving image, however, it is preferable that the points are described in time code or frame ID. In "Thumbnail Type ID", an ID indicating the purpose of the thumbnail is described. In the present embodiment, Thumbnail Type IDs are determined for purposes of thumbnail as follows.

Thumbnail Type ID=1: for browser  
Thumbnail Type ID=2: for moving image editing  
Thumbnail Type ID=3: for printing

In this example, IDs are defined for application types to use the thumbnail.

Further, in "Thumbnail Offset", an offset to the thumbnail indicated by the index is described.

Figs. 6A and 6B are tables showing examples of data structure of thumbnail 405 in the header 401 and 1 thumbnail in the thumbnail area 407 in the footer 403 in Fig. 4. In Fig. 6A, in "Thumbnail Header", management information of the thumbnail image or the like is described. Further, in "Thumbnail Image", the thumbnail image data itself is described. Further, Fig. 6B shows

an example of data structure of the "Thumbnail Header".  
In "Thumbnail Image Offset", an offset from the head of  
the "Thumbnail Header" to the storage position of the  
thumbnail image is described. In "Thumbnail Image Size",  
5 the size of the thumbnail image is described. In  
"Thumbnail Key Relative Point", the frame position in  
the moving image as a base of the thumbnail is described  
as a relative position from the "Start Point".

<Thumbnail Registration Processing>

10 Fig. 7 is a flowchart showing an example of  
thumbnail registration operation according to the  
embodiment.

First, at step S100, the moving image input unit  
301 inputs a moving image, and records it in the format  
15 of the moving image file 400 shown in Fig. 4 into the  
moving image file storage unit 302. At this time, an  
area for storing a thumbnail in the header 401 and a  
footer area are ensured as reserved areas (physical area  
of the storage medium). For example, in case of optical  
20 disk, the reserved areas are ensured in inner  
circumferential area. Next, at step S101, it is  
determined whether or not thumbnail designation has been  
made by the user. The thumbnail designation means  
designation of arbitrary frame in the moving image as a  
25 base of the thumbnail, a section in the moving image  
represented by the thumbnail, the purpose of the  
thumbnail, designation as to whether the thumbnail is

important or not, and the like, made by the user  
utilizing the function of the apparatus at this step  
S101. When the user makes setups, the user sets the  
apparatus to a setting mode, then designates a desired  
5 section in the moving image by the keyboard or the mouse,  
then performs reproduction, and when an image from which  
the user wants to form a thumbnail is displayed, the  
user designates a frame to be a thumbnail by the  
keyboard or the mouse. In this case, the designated  
10 frame is a base image of the thumbnail, and the  
designated desired section is the section in the moving  
image represented by the thumbnail. Note that in the  
thumbnail setting, various methods of e.g. user's  
setting and automatic setting by the apparatus may be  
15 used. In the present invention, any of setting may be  
employed. Further, designation of the purpose of  
thumbnail, designation as to whether the thumbnail is  
important or not, may be made by the keyboard or the  
mouse via a predetermined user interface.

20       Next, at step S102, it is determined whether or  
not the designation that the thumbnail is important has  
been made. The designation of important thumbnail means  
that the thumbnail most properly represents the entire  
moving image file. If the designation of important  
25 thumbnail has been made by the user, process proceeds to  
step S103, at which the frame position designated for  
the generation of thumbnail is corrected to a relative

position from the head of the moving image file, to obtain the "Thumbnail Key Relative Point". Next, at step S104, a thumbnail is generated from the designated frame, and the thumbnail, having the "Thumbnail Key Relative Point" calculated at step S103, the size of the thumbnail image (Thumbnail Image Size), and information on relative distance to the storage position of the thumbnail image (Thumbnail Image Offset) as a header, is recorded into the header 401. At this time, the header 401 is stored in a position for comparatively quick and easy access on the storage medium, e.g., in use of optical disk, in an inner peripheral portion. Then, the process returns to step S101.

On the other hand, if it is determined at step S102 that the designation of significant thumbnail has not been made, the process proceeds to step S105. At step S105, a new index is ensured in an unused area of the index area 406 in the footer 403 in the moving image file 400. Next, at step S106, a new thumbnail is ensured in an unused area of the thumbnail area 407. Next, at step S107, an offset value to the thumbnail ensured at step S106 is calculated.

Next, at step S108, the type of designated thumbnail is determined based on the purpose designated by the user. In the present embodiment, any one of browsing, moving image editing and printing is designated by the user as the purpose. The process



branches to one of steps S109 to S111 in accordance with the designated type, and a corresponding Thumbnail Type ID is set. The ID setting is made by holding a table of the above-described Thumbnail Type IDs in advance and  
5 referring to the table. In the present embodiment, if the purpose is browsing, setting is made as Thumbnail Type ID=1 (S109); if the purpose is moving image editing, setting is made as Thumbnail Type ID=2 (S110); and if the purpose is printing, setting is made as Thumbnail  
10 Type ID=3 (S111). In the present embodiment, 3 types are given, however, the number of types is not limited to 3.

Next, at step S112, an index having the offset (Thumbnail Offset) calculated at step S107, the Thumbnail Type ID set at steps S108 to S111, and the  
15 Start Point and the End Point indicating the section designated by the user, is generated, and stored into the footer 403.

Next, at step S113, the position of the frame adopted as the thumbnail is corrected to a relative  
20 position from the header of the section, and the Thumbnail Key Relative Point is obtained. At step S114, a thumbnail is generated by reducing the frame designated at step S101, and the thumbnail is stored, with the Thumbnail Key Relative Point calculated at step  
25 S113, the image size (Thumbnail Image Size) of the thumbnail and information on a relative distance to the storage position of the thumbnail image (Thumbnail Image

Offset) as the Thumbnail Header (Fig. 6A), into the footer 403. Next, the process returns to step S101, and if the designation of thumbnail is made again, the processing at steps S102 to S114 is repeated. Note that  
5 it is preferable that the footer 403, especially the thumbnail area 407, is stored in a continuous area on the storage medium.

Further, if it is determined at step S101 that the designation of thumbnail has not been made, the process  
10 proceeds to step S115, at which if it is determined that termination of registration processing has been instructed, the process ends. If it is determined that the termination of registration processing has not been instructed, the process returns to step S101, to repeat  
15 the above processing.

By the above processing, an significant thumbnail can be stored in a position for quick and easy access (e.g. in use of optical disk, an inner peripheral portion) on the storage medium. Further, thumbnails for  
20 different purposes can be discriminated by Thumbnail Type IDs, these thumbnails can be stored in the same file, thus management can be simplified.

#### <Thumbnail Utilization Processing>

Processing upon utilization of thumbnail  
25 registered by the above thumbnail registration processing will be described.

First, utilization of thumbnail in a browser will

be described. Figs. 8A and 8B are examples of user interface of a browser. In Fig. 8A, numeral 801 denotes an entire display area of the browser. Numeral 802 denotes an area where arrayed thumbnails are displayed.

- 5 The thumbnails are displayed from the top line, from the left to the right. Numeral 803 denotes a scroll bar. In a case where the thumbnails cannot be displayed within the thumbnail display area 802 at once, they can be sequentially displayed by dragging in the scroll bar.
- 10 Numeral 804 denotes a pointer. The user moves the pointer 804 by operation at the user operation unit 300, to designate a desired thumbnail in the thumbnail display area 802. When the thumbnail is selected by the pointer 804, the display screen image changes to a
- 15 moving-image reproduction screen image 805 as shown in Fig. 8B, and moving image reproduction is started.

Hereinbelow, processing to realize the utilization of thumbnail in a browser will be described. Figs. 9A and 9B are flowcharts showing processing upon browser

20 operation in the moving image management apparatus. Note that the processing shown in Figs. 9A and 9B is executed when browser processing is started in the moving image management apparatus and a moving image file to be browsed is designated. Note that upon designation of

25 moving image file to be browsed, the thumbnails representing the respective moving image files (thumbnails stored in the headers of the respective

moving image files) are displayed in the thumbnail display area in Fig. 8A, and a desired moving image file is selected by designating a desired thumbnail by the pointer 804. When the desired moving image file is  
5 selected, the processing shown in Figs. 9A and 9B is started.

First, at step S201, the browse unit 304 reads the header 401 of the moving image file 400 selected by the above operation among the moving image files stored by  
10 the moving image file storage unit 302. Then the browse unit obtains various basic management information such as the file size from the moving image file management information 404, and stores the information into the memory (RAM 203). Next, at step S202, the unit reads the  
15 index area 406 in the footer 403, and performs sorting on the indexes included in the index area 406 read at step S202 by start position (Start Point in Fig. 5) in ascending order, for display of thumbnails to be described later in time sequential order.

20 Next, at step S204, a thumbnail display start number N is obtained from the current position of the bar of the scroll bar 803. For example, if the scroll bar 803 is at an upper end (as shown in Fig. 8), display start number N = 1 holds. Accordingly, display is  
25 started from the first thumbnail.

Next, by performing the following processing at steps S205 to S212 sequentially from the head index,

thumbnails for browsing are displayed in the thumbnail display area 802 from the N-th and subsequent thumbnails.

First, at step S205, it is checked whether or not the thumbnail in the index is for browsing by checking  
5 the Thumbnail Type ID in the index. As described above, assuming that Thumbnail Type ID=1 to 3 are defined, it is determined that a thumbnail for which Thumbnail Type ID=1 is set is a thumbnail for browsing. Note that upon start of processing, checking is started from the head  
10 after the sorting.

If it is determined at step S205 that it is a thumbnail for browser, the process proceeds to step S206. At step S206, the number C (the order in the thumbnails for browser) is counted. At step S207, it is checked  
15 whether or not the counted number C is less than the display start number N ( $C < N$ ). This processing is made for skipping thumbnails before the number N without display.

If the number C is equal to or greater than the  
20 display start number N, the thumbnail image is read for thumbnail display at the next step S208. Next, at step S209, the thumbnail image is displayed in the thumbnail display area 802, and the process proceeds to step S210. On the other hand, if it is determined at step S205 that  
25 the thumbnail is not for browsing, or if it is determined at step S207 that the number C is less than the number N, the process proceeds to step S210.

At step S210, the processing subject is moved to the next index to process the next thumbnail. In a case where the immediately previous processing has been performed on the last index and there is no next index, 5 the process proceeds to step S213. If the next index exists, the process proceeds to step S212, at which it is checked whether or not the number has exceeded the number of displayable thumbnails in the thumbnail display area 802. For example, in the example in Fig. 8, 10 the number of displayable thumbnails is 9. If the number is not over the number of displayable thumbnails, the process returns to step S205. That is, the processing at steps S205 to S210 is performed to sequentially check the indexes until there is no index to be processed or 15 the number exceeds the number of displayable thumbnails.

If there is no index to be processed or the number exceeds the number of displayable thumbnails in the thumbnail display area 802, the process proceeds to step S213. At step S213, it is checked whether or not the 20 scroll bar has been operated by the user. If it has been operated, the processing at steps S204 to S212 is repeated, thereby a thumbnail corresponding to the position of the operated scroll bar is displayed. If the scroll bar has not been operated, the process proceeds 25 to step S214.

Next, at step S214, it is determined whether or not one of the thumbnails displayed in the thumbnail

display area 802 has been selected by the user. If a thumbnail has been selected, the process proceeds to step S215, at which the Start Point is read from the index corresponding to the selected thumbnail. Next, at  
5 step S216, moving image reproduction is started from the Start Point, and the moving image is displayed in the moving image reproduction screen image 805. Thereafter, the process proceeds to step S217. On the other hand, if it is determined at step S214 that a thumbnail has not  
10 been selected, the process proceeds to step S217.

At step S217, it is determined whether or not termination of browsing by the browse unit 304 has been instructed. If it is determined that termination has not been instructed, the process returns to step S213. If it  
15 is determined that termination has been instructed, the process ends.

Note that in the above example, when a thumbnail is selected, the Start Point is obtained from the corresponding index and reproduction is started from the  
20 position, however, the reproduction is not limited to this arrangement. It may be arranged such that the Start Point and the End Point are obtained from the index corresponding to the selected thumbnail and only the section is reproduced.

25 In the above description, browsing is made in one moving image file for the sake of simplicity of explanation, however, even in thumbnail selection in

plural moving image files, the selection can be made by repeating the processing to display a thumbnail for the respective moving image files.

By the above processing, the browse unit 304 reads  
5 only thumbnail(s) for browsing from the thumbnail area  
407 and utilizes it.

Next, utilization of thumbnail in moving image editing will be described. In this example, the following case is supposed. That is, thumbnails for  
10 editing has been added to each moving image file beforehand. These thumbnails are utilized to collect favorite scenes which are scattered in the plurality of files, in order to create single moving image data or create a play-list describing reproduction designation  
15 information of a plurality of moving image files. Fig. 10 is an example of the user interface upon moving image editing by an editing unit 305. Numeral 1000 denotes an editing operation window in which an editing operation is performed. Numeral 1001 denotes a reproduction window  
20 in which a selected moving image file or the result of editing is reproduced for checking. Numeral 1002 denotes a moving image file window for display of a list of thumbnails in the headers of the respective moving image files. Numeral 1003 denotes operation buttons for  
25 operation of moving image reproduced in the reproduction window 1001, for "reproduction, temporary stoppage, stoppage, reverse and fast-forward" operations from the



left.

Numeral 1004 denotes a scene designation window in which selected moving image files are arrayed for designation of section in the respective moving images.

5 Note that as display of the respective moving image files, thumbnail images are overlay-displayed for the user's recognition. Numeral 1005 denotes a scene designation bar. The start point and the end point of selected clip (hatched portion) can be designated by

10 operating the scene designation bar. For this purpose, contents of frames corresponding to a portion of the moving image indicated by the scene designation bar 1005, are displayed in the reproduction window 1001 while the scene designation bar 1005 is operated. Accordingly, the

15 user can accurately specify the start point and the end point by confirming the image displayed in the reproduction window 1001 and operating the scene designation bar 1005.

Numeral 1006 denotes a pointer. The user moves

20 the pointer 1006 by operating the user operation unit 300, to designate selection of various buttons and designation of operation. In an operation procedure, a moving image files are selected from the moving image file window 1002 and dragged and dropped into the scene

25 designation window 1004 in the order of reproduction. Then, the start point and the end point area corrected by using the scene designation bar 1005. At this time,

the user performs moving image reproduction in the reproduction window 1001 by operating the operation unit 1003 in accordance with necessity thereby checks the image.

5           Fig. 11 is a flowchart showing a thumbnail display operation upon the moving image editing by the editing unit 305. Note that the processing in Fig. 11 is started when moving image editing processing is executed in the moving image management apparatus.

10           First, at step S300, the editing unit 305 reads the header 401 of all the moving image files from the moving image file storage unit 302. Next, at step S301, the editing unit reads the thumbnail 405 in the header 401 of the respective files. Then at step S302, the  
15 editing unit displays the thumbnails in the headers as representative images of the respective moving image files in the moving image file window 1002.

          Next, at step S303, it is determined whether or not a moving image file has been selected. In the  
20 present embodiment, it is determined whether or not the moving image file(s) has been dragged and dropped from the moving image file window 1002 to the scene designation window 1004 by operation of the pointer 1006. If moving file(s) has been selected, the process  
25 proceeds to step S304, at which the index area 406 is read from the footer in the moving image file selected by the user. Then, bar display is performed to display

the moving image file in the scene designation window 1004. At this time, the entire moving image is the range of designation for the selected moving image file.

Further, at this time, a representative thumbnail of the moving image file is displayed as the bar display of the moving image file displayed in the scene designation window 1004. On the other hand if it is determined at step S303 that moving image file selection has not been made, step S304 is skipped.

Next, at step S305, it is checked whether or not the user has designated a range of scene regarding the moving image file by the scene designation bar 1005 in the scene designation window 1004. If the range designation has been made, thumbnail(s) for editing existing within the range designated by the user is extracted and displayed at steps S306 to S311.

First, at step S306, the Start Point and the End Point in the index (upon start of processing, the head index) are referred to, and it is determined whether or not a section indicated by the Start Point and the End Point is within the range designated by the user. If it is within the range, the process proceeds to step S307, at which it is determined whether or not the thumbnail corresponding to the index is a thumbnail for editing. The checking is made by checking the Thumbnail Type ID in the index. In a case where the Thumbnail Type IDs are defined as described above, if Thumbnail Type ID=2 holds,

it is determined that the thumbnail is for editing. If it is a thumbnail for editing, the process proceeds to step S310.

On the other hand, if it is determined at step  
5 S306 that the section corresponding to the index is not within the range designated by the user, or if it is determined at step S307 that the thumbnail is not for editing, the process proceeds to step S308 to process the next index. At step S309, it is determined whether  
10 or not the next index exists. If the next index exists, the processing at steps S306 and S307 is repeated.

If the condition at step S307 is satisfied, the process proceeds to step S310, at which a thumbnail image corresponding to the index is read. Then at step  
15 S311, the thumbnail image is displayed. For example, as shown in Fig. 10, in the scene designation window 1004, the thumbnail image is overlay-displayed on a bar indicating the scene. By this display, the user can easily recognize the scene in the designated range.  
20 Thereafter, the process proceeds to step S308, to repeat the above-described processing on the next index.

By the above processing, thumbnails of all the sections within the range designated by the user are overlay-displayed on the bars indicating the scenes.  
25 Note that the display range of thumbnail is an area designated by 2 scene designation bars 1005. If the size of area between the designation bars is insufficient, a

part of the thumbnail may be overlaid or a scroll bar may be displayed for scrollable display.

If it is determined at step S305 that a scene range has not been designated by the user, or if it is  
5 determined at step S309 that there is no index to be processed, the process proceeds to step S312. At step S312, it is determined whether or not termination of the moving image editing operation has been instructed. If the termination of the editing operation has not been  
10 instructed (the moving image editing is performed), the process returns to step S303 to repeat the above processing. On the other hand, if it is determined that the termination of the editing operation has been instructed, the process ends.

15 By the above processing, upon file selection, the editing unit 305 can use a significant thumbnail stored in the header, and utilize only thumbnails for moving image editing corresponding to the designated range from the thumbnail area 407.

20 Note that in the above embodiment, the browsing and moving image editing have been described as utilization of thumbnail images, however, the usage is not limited to these 2 operations, but thumbnail images can be used for various purposes such as printing of  
25 frame image corresponding to a selected thumbnail. For example, if a frame image corresponding to a selected thumbnail is printed, processing as shown in the

flowchart of Fig. 12 is performed. First, a thumbnail is obtained from the header 401 of the respective moving image files, and the thumbnails are displayed in a list, then a desired moving image file (moving image data) is designated by the user (S401). Among the thumbnails corresponding to the designated image data (thumbnails recorded in the footer), thumbnails where the Thumbnail Type ID is "3" are extracted and displayed (S402 and S403). In the subsequent processing, one of the thumbnail is selected, and a frame as a base of the selected thumbnail is printed. That is, an image of the frame specified by the Thumbnail Key Relative Point as shown in Fig. 6 of the designated thumbnail is obtained (S404 to S406), and it is outputted for printing (S407). Accordingly, another function such as a printing unit may be added to the moving image processing apparatus in Fig. 3. Note that if selection from the displayed thumbnail is not performed and termination is instructed, the process ends (S404 and S408).

Note that in the above embodiment, the browsing unit and the editing unit are provided as functions for utilizing thumbnails, however, 3 or more functions including the above-described printing unit or the like, or only one of them, or another combination of other functions may be used.

Note that in the above embodiment, the moving image processing shown in Fig. 3 is a single apparatus

including the moving image input unit 301, the thumbnail  
formation unit 303, the browse unit 304, and the editing  
unit 305. However, the moving image processing apparatus  
may be constructed as plural apparatuses of respective  
5 functions, including the above-described printing unit,  
or apparatuses having combinations of several functions.  
In such case, a moving image file including thumbnails  
may be transmitted among the respective apparatuses via  
a storage medium or communication means such as IEEE  
10 1394.

Note that in the above embodiment, since there is  
no index for the header thumbnails, the header  
thumbnails do not have the Start Point, the End Point  
and the Thumbnail Type ID, however, these information  
15 may be held as management information. In this case, a  
number or the like indicating the purpose of thumbnail  
is stored, and it can be utilized in various  
applications.

Note that in the above embodiment, the thumbnail  
20 recorded in the header (thumbnail representing the file)  
is not recorded in the footer, but the thumbnail may be  
recorded in the header and the footer.

Further, if one thumbnail is used for plural  
purposes (e.g., browsing and editing), such plural  
25 purposes can be designated by deciding a value stored in  
the Thumbnail Type ID to an appropriate value. Further,  
according to operation purposes, thumbnail can be

properly utilized. For example, head image of a certain scene is used for thumbnail for browsing while representative image of the scene is used for thumbnail for editing.

5           As described above, according to the present embodiment, as thumbnails for different purposes can be stored in 1 file, management of the thumbnails is simplified. Further, upon use of the thumbnails, only thumbnail(s) corresponding to the purpose can be  
10 utilized by referring to the type information attached to the thumbnails (Thumbnail Type ID).

          Further, the object of the present invention can be also achieved by providing a storage medium storing program code for performing the aforesaid processes to a  
15 system or an apparatus, reading the program code by a computer (e.g., CPU, MPU) of the system or apparatus from the storage medium, then executing the program.

          In this case, the program code read from the storage medium realize the functions according to the  
20 embodiment, and the storage medium storing the program code constitutes the invention.

          Further, the storage medium, such as a floppy disk, a hard disk, an optical disk, a magneto-optical disk, a CD-ROM, a CD-R, a magnetic tape, a non-volatile type  
25 memory card, and a ROM can be used for providing the program code.



Furthermore, besides aforesaid functions according to the above embodiment are realized by executing the program code which are read by a computer, the present invention includes a case where an OS (operating system) or the like working on the computer performs a part or entire processes in accordance with designations of the program code to realize functions according to the above embodiment.

Furthermore, the present invention also includes a case where, after the program code read from the storage medium is written in a function expansion board which is inserted into the computer or in a memory provided in a function expansion unit which is connected to the computer, CPU or the like contained in the function expansion board or unit performs a part or entire process in accordance with designations of the program code and realizes functions of the above embodiment.

#### EFFECT OF INVENTION

As described above, according to the present invention, operability of moving image data using a representative image is improved upon execution of various moving image data processing by adding a type attribute to a representative image, and management of representative images can be simplified.

As many apparently widely different embodiments of the present invention can be made without departing from

the spirit and scope thereof, it is to be understood that the invention is not limited to the specific embodiments thereof except as defined in the appended claims.